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Research Article

To Find Prevalence of Anaemia among School Going Adolescent Girls of Shimla Hills

Dr. Harinder Singh[1], Dr. Hardeep Singh Gill[2], Dr. Gurmanpreet[3]
[1]Associate Professor, Department of Community Medicine, Gian Sagar Medical College & Hospital, Banur, Rajpura-140401, Punjab, India
[2]Associate Professor, Department of General Surgery, Gian Sagar Medical College & Hospital, Banur, Rajpura- 140401, Punjab, India
[3]Assistant Professor, Department of Biochemistry, Adesh University, Bathinda-151001, Punjab, India

***Corresponding author**
Dr. Hardeep Singh Gill
Email: hardeepgill77@gmail.com

Abstract: Anaemia is the most common and widespread nutritional disorder in the world. Anaemia is one of the major public health problems, affecting both sexes and all ages. It adversely affects the cognitive performance, behavior, and physical growth of infants, preschool and school-aged children. The immune status and morbidity from infections is affected by anaemia, of all the age groups. Specifically, anaemia during pregnancy increases perinatal risks for mothers and neonates; and increases overall infant mortality rate. In India, adolescent girls, who constitute a sizeable segment of its population, constitute a vulnerable group on account of son preference and practice of early marriage leading to a greater risk of morbidity and mortality. Several studies reported earlier confirm the need for special attention to improve the health & nutritional status of adolescents. In view of the immense public health consequences of anaemia, this study was conducted in the field practice areas of Department of Community Medicine, IGMC, and Shimla. A total of 421 girls were studied. They were clinically examined & predesigned & pre tested proforma as were filled up. Haemoglobin assessment was done using Filter paper Cyan metha emoglobin technique. Out of the sample of 421 girls in our study a total of 235 (55.34%) girls were found to be anaemic (Hb less than 12 g/dl). Mean haemoglobin in the study subjects was observed to be 11.46±3.16 and median value was found to be 11.6.gm/dl. From the literature searches, documented in the review of this thesis, the prevalence of anaemia in adolescent girls from India varied from 46 to 88%, and mean haemoglobin values varied from 7.6 to 12.7g/dl. So it was concluded that anaemia is prevalent in girls around menarche and Iron & folic acid supplementation is one of the most important nutritional interventions for adolescent girls.
Keywords: Anaemia, Adolescent, Haemoglobin, Cyan metha emoglobin, Iron deficiency.

INTRODUCTION

Anaemia is one of the most frequently observed nutritional deficiency diseases in the world today. It is especially prevalent in developing countries, that too among women of child bearing age, adolescents, pregnant and lactating mothers. The immune status and morbidity from infections is affected by anaemia, of all the age groups. It hampers the use of energy sources by muscles and thus the physical capacity and work performance of adolescents and adults of all the age groups.

It has been found that a total of 2170 million people are anaemic, according to WHO criteria[2]. Every 9 out of 10 persons affected of anaemia live in developing world. Prevalence rates though are higher in developing than in industrialized countries, but in latter still reach levels of public health significance (above 10%) in pregnant women. In developing countries, prevalence rates in pregnant women are commonly in the range of 40-60%, among other women 20-40% and in school age children and adult men, around 20%. Around half of those with anaemia are suffering from iron deficiency anaemia. However, many more are likely to be iron deficient i.e. having deficient body iron stores, but without frank anaemia, the latter are therefore considered to be at risk of iron deficiency anaemia. Foliate deficiency and other causes mentioned above account for the major proportion of remaining anaemias.

A linear relationship has been reported between iron deficiency and work capacity for agricultural workers in studies conducted in different countries. Work capacity returned rapidly to normal with iron supplementation. Similarly, iron supplementation increased work output among the other working classes like road workers, rubber tappers, tea

pickers and industrial workers in many countries. Gains in productivity and take-home pay ranged from 10% to 30% of previous levels.

Though the state of Himachal Pradesh has made significant progress in the health front but the nutritional status of adolescent girls is poor as indicated by NFHS survey[16]. In Himachal Pradesh not much work has been done on anaemia in adolescent population, hence the present exercise is an attempt to find out prevalence of anaemia among school going adolescent girls and to correlate the associated socio-demographic factors. An attempt was also made to assess the knowledge of the adolescent girls about anaemia.

AIMS & OBJECTIVES

To find out prevalence of anaemia in school going adolescent girls.

MATERIAL & METHODS:

Study Population

The present Cross sectional study was carried out amongst school going adolescent girls studying in 6^{th} – 12^{th} classes in the government schools located in rural & urban field practice areas of Department of Community Medicine, Indira Gandhi Medical College, and Shimla. WHO has defined adolescence as a period of life between 10-19 years of age, therefore girls falling in this age group were taken in the study.

Definition of anaemia for the purpose of study- WHO has defined the thresholds below which person is said to be anaemic.

Age group	Haemoglobin below	
	g/l	mol/l
Children 5-11 years	115	7.13
Children 12-14 years	120	7.45
Non-pregnant women	110	6.83

Sample Size: In this study, sample size to be studied has been calculated taking into consideration prevalence of 50% & with allowable error of 10%. Sample size is as under.

$n= 4pq/L^2$
n=Sample size
p=prevalence i.e. 50%
q=100-p i.e. 50%
Allowable error L=10% of prevalence
N=4x 50 x 50/10% of 50
= 400.00
Thus a sample of 421 subjects was studied. Outs of those 209 were studied in the urban & 212 subjects were taken from rural area.

Study Duration: Study was conducted for one year.

Sampling: To start with all the government senior secondary schools falling in the field practice areas were listed. One school from each area (urban/rural) was selected randomly & permission from the Head of the Institution was taken to conduct the study. Number of subjects was selected proportionate to the total strength of the girl students in each school by systematic random sampling technique. A total of 421 girl students from rural & urban areas were selected. The selected students were given consent forms in advance to obtain the consent of parents/guardian for participation in the study. History, general physical examination & clinical examination were done and noted on pre-designed & pre-tested proforma as. This was followed by collection of blood samples. In the end proforma as were analyzed using standard statistical methods (Epi Info/Excel).

Investigation: Blood samples (20µl) were collected by prick method from ring finger of individuals using standardized pipette on Whitman filter paper no.1 after recording particulars on each filter paper, these were dried & placed in individual envelopes. Haemoglobin levels were estimated by colorimeter using cyan metha emoglobin technique.

OBSERVATIONS & RESULTS

The present study was a community-based study conducted in the field practice area of Department of Community Medicine, IGMC, and Shimla.

Table 1: Distribution of study population as per age and anaemia status

Age	Total	No of anaemic
11-13	109	56 (51%)
13-15	129	77 (60%)
15-17	169	99 (59%)
17-19	14	3 (21%)
Total	421	235 (56%)

Chi square = 8.89, p value <0.05, df =3

As is evident from Table 1 maximum percentage of girls were anaemic in the age group 13-17 years (59-60%), followed by 11-13 years (51%). Prevalence of anaemia was much less in the age group 17-19 years (21%).

Table 2: Distribution of study subjects according to the class in which they were studying

Class studying	No. of anaemias	Non anaemias	Total
7^{th} & 8^{th}	58 (52%)	53	111
9^{th} & 10^{th}	75 (54%)	65	140
11^{th}& 12^{th}	102 (60%)	68	170
Total	235 (56%)	186	421

Chi sq = 2.06, df = 2, p value < 0.05.

Anaemia was more prevalent in higher classes 11^{th} & 12^{th} (60%) as compared to the lower ones (52%).

DISCUSSION

As per Williams hematology [1], in about 1500 BC a disease characterized by pallor, dyspnoea and oedema was described in Papyrus Ebers, a manual of therapeutics believed to be the oldest complete manuscript extant. This ancient disease may have been due to chronic blood loss from hookworm infestation.

By the beginning of twentieth century, it had been established that chlorosis was characterized by a decrease in the iron content of blood. Most investigators now view chlorosis as resulting from a combination of factors affecting adolescent girls: the demand of growth & the onset of menses, an inadequate diet & legacy of poor iron stores at birth from an iron deficient mother.

Energy, vitamin A and zinc deficiencies can increase the severity of malaria infection, which may cause or exacerbate anemia. The relative importance of different causes varies by region. Malaria is a major cause of anaemia in Sub-Saharan Africa. Iron deficiency is a major cause of anaemia in all developing countries, including Africa, where consumption of iron is limited because dietary sources of iron are not affordable by most families.

According to WHO database, in industrialized countries, the most affected groups are pregnant women (18% anaemic), school children (17% anaemic), non-pregnant women and the elderly, (both12% anaemic). In the non-industrialized countries, the most affected population groups are pregnant women and school aged children (both 53% anaemic), non-pregnant women (44% anaemic) and the elderly (51% anaemic) [2].

A study [3] was carried out during January/February 2001 in Deshna and Armant Districts of Qena Governorate, Upper Egypt, to establish the prevalence of anaemia among schoolchildren aged 6 to 11 years and define appropriate control interventions in the area. Haemoglobin levels were measured directly in schools using a portable spectrophotometer. The mean (SD) level of haemoglobin in 1844 schoolchildren in 37 schools was 12.79 (1.15) g/dL. Only 12% of children were below the WHO cut-off for anaemia for this age group (< 11.5 g/dL) and no cases of severe anaemia (< 7.0 g/dL) were detected. The low prevalence of mild to moderate anaemia indicates that mass iron supplementation is not justifiable, but routine monitoring of haemoglobin levels should be part of the public health activities in the schools.

In a study [4] it was found that about 27% of adolescents are estimated to be anaemic in developing countries, compared to 6% in developed countries. Regional figures [5], although varying by country within the region, suggest the following prevalence rates for anaemia: In Africa, 45% for girls and 57% for boys. In Oceania, 45% for girls and 43% for boys. In Latin America and the Caribbean, 12% for girls and 22% for boys. In Asia, 19% for girls and 17% for boys. In studies conducted by the International Center for Research on Women [6], country findings on adolescent anemia among both males and females include High rates of anemia in Nepal (42%), India (55%), and Cameroon (32%) Moderate rates in Ecuador (17%) and Jamaica (16%) Similar rates in studies which included both genders (India and Cameroon). Significantly more boys than girls in Ecuador (20% versus 15%).

A study on adolescents in China revealed that 61.8% of girls were anaemic [7]. Another study showed that iron deficiency was more prevalent in females than in males, highest rate being in teenage girls [8]. In a study [9] conducted in semi urban Nepal, the prevalence of anaemia in adolescent girls aged 11-18 years was found to be 68.8%.

A study [10] carried out in 1982, showed that among girls less than 15 years of age, 65% in Hyderabad, 69% in Delhi & 97% in Calcutta had Hb levels less than 11g%. Vasanti *et al.;* [11] in 1994 conducted an urban slum school based study in Hyderabad, Andhra Pradesh. In this study 239 girls from urban & 312 from rural area were compared. Hb (g/dl) was noted to be 13.4, 12.9 ± 2.3 and 13.0 ± 1.9 in rural girls as compared to 12.5, 12.9 ± 1.5 and 12.3 ± 1.6 in urban sample in <12 years, 12-14 years and >14 years old girls respectively. The serum ferritin values (μg/l) came out to be 46.3, 28.3 ± 26.5 and 24.9 ± 19.4 in rural girls vs. 29.3, 33.2 ± 17.6 and 32.5 ± 28.6 in urban girls, in the age group of <12 years, 12-14 years and >14 years respectively.

In a study [12] conducted in a rural area of Chandigarh during 1994-95, 128 families out of 500 families in village Palsora were taken. Majority of the families in study population were nuclear with average family size of 4.8. The prevalence of anaemia was highest (53.3%) among adult females. When compared with educational status, it was found to be higher

among illiterate (61.4%) as compared to those who were matric and above (14%) (P>0.05). Prevalence of anaemia was highest among the age group of 25-44 years followed by 15-24 years age group (22.1%).

An urban school based study was conducted at Dharwad, Karnataka by Manjula *et al.;* [13] in 1996. Random sampling & proportional allocation was done thus enrolling 200 adolescents from both sexes in the age group of 13-18 years. Mean Hb of the adolescents was 12.82g% ranging from 10.8 to 14.2 g%. Only 4% of the subjects were anaemic. Differences as per age and sex were not significant.

In the desert region, Rajasthan a community based cross-sectional study done by Saxena [14] in 1996, observed 60% of the girls had iron deficiency anaemia, as compared to 30% prevalence in boys, in the age group of 7-15 years. An urban, school based study by Jondhale *et al.;* [15], conducted at Parbhani, Maharashtra studied 300 girls by random sampling in the age group of 13-15 years of age. Prevalence of anaemia was found 88.3%.

NFHS II [16] conducted a survey and found that overall, 52 percent of women have some degree of anaemia. Thirty-five percent of women are mildly anaemic, 15 percent are moderately anaemic, and 2 percent are severely anaemic. There are some differences in the prevalence of anaemia by background characteristics, but anaemia is substantial for women in every population group. The prevalence of anaemia is slightly higher for younger women less than age 25 than for older women and for women who are not currently married than for currently married women. It is considerably higher for rural women (54 percent) than for urban women (46 percent). Anaemia decreases steadily with increases in the level of educational attainment, from 56 percent among illiterate women to 40 percent among women who have completed at least high school. Anaemia also decreases steadily with increases in the standard of living index. About half of Hindu, Muslim, and Buddhist women are anaemic. Anaemia is slightly lower among Christians and substantially lower among Sikhs and Jains. The highest levels of anaemia are evident for women from 'other' religions and women with no religion. By caste/tribe, scheduled-tribe women have the highest levels of anaemia (65 percent), followed by scheduled-caste women (56 percent) and women from other backward classes (51 percent). Women who are not in any of these three groups have the lowest level of anaemia (48 percent). The prevalence of anaemia does not vary much by work status, but women who do not work have slightly less anaemia than working women. The prevalence of anaemia is slightly higher for breastfeeding women than for other groups, but there is no difference in the prevalence of anaemia between pregnant women and nonpregnant women who are not breastfeeding. Since anaemia is often considered to be particularly problematic for pregnant women, it is noteworthy that these women have slightly lower than average levels of anaemia. The provision of iron and folic acid supplements to pregnant women has undoubtedly reduced the overall prevalence of anaemia in pregnant women (58 percent of pregnant women received IFA tablets or syrup during pregnancy for births in the three years preceding the survey). However, by far the highest levels of moderate anaemia are experienced by pregnant women (25 percent), and pregnant women also are subject to a somewhat higher level of severe anaemia.

Jondhale *et al.;* [17] in 2001conducted a study by enrolling 300 girls in the age group 13-15 years by stratified sampling technique. It was an urban based study done at Parbhani in Maharashtra. 20% girls were clinically found to be anaemic. Anaemia was more prevalent in 13 years of age.

In a multi centric study by DNP, ICMR [18] in 2001 conducted in 16 districts from 13 states by enrolling 4337 adolescent girls by cluster sampling technique. Overall prevalence of mild, moderate v& severe anaemia was 32.1, 50.9, & 7.1% respectively. 90.1% of the girls were found to be anaemic (Hb<12g). Several studies reported earlier also confirm the need for special attention to improve the health and nutritional status of the adolescents [19-26].
Thus we find anaemia in adolescent girls is a public health problem, with its bearing on physical, mental and social wellbeing of community.

Iron requirements on a body weight basis are proportional to growth velocity. Accordingly, in addition to women in their reproductive years as a result of physiological losses, iron deficiency is most common in the preschool years and during puberty. In our study more number of the girls was anaemic in the age group 13-15 years (60%). Prevalence of anaemia was much less in the age group 17-19 years (21%). Age group 13-15 years is the period, which corresponds to the age of menarche and growth spurt of adolescence in girls. Both these factors put greater demand for iron in the diet.

Verma *et al.;* [27] also noted anaemia to be higher in the girls who were having BMI less than 18.5 vs. those with BMI more than 18.5 (82.4% as compared to 79.7%). Such an association is also noted by Sharma, *et al.;* [28].

The Integrated Management of Childhood Illness (IMCI) [29] strategy developed by the WHO recommends the use of palmar pallor as the initial screening tool. This recommendation is based on the interpretation of results of studies performed in the Gambia [30], Kenya [31], and Malawi [32]. None of these studies showed in fact a clear superiority of palmar pallor. Only the Kenya study showed that

palmar pallor performed better than conjuctival pallor when used by health workers but not by study physicians [31].

SUMMARY & CONCLUSIONS:

The study was conducted in the urban & rural field practice areas attached to the Department of Community Medicine, IGMC, and Shimla during over a period of one year. A sample of 421 subjects (212 rural and 209 urban) were studied. Out of these, 235 (55.34%) girls were found to be anaemic. Prevalence of anaemia was maximum in the age group 13-15 years, i.e. the age of menarche. So, it is recommended that following should be done to prevent anaemia in adolescent girls:

1. Screening of adolescent girls for anaemia.
2. Need to improve general nutritional status of girls.
3. For the setting where there is silent burden of anaemia, due to majority of asymptomatic cases, iron supplementation for all is suggested as a control strategy.

Iron and folic acid supplementation is one of the most important nutritional interventions for adolescent girls. Folic acid is included with the iron to prevent folic acid deficiency, which is implicated in the etiology of anaemia and associated with neural tube defects of new born. Supplementation with Folic acid before pregnancy offers a better chance of preventing neural tube defects, than if given during pregnancy.

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